

**AEROSPACE
MATERIAL
SPECIFICATION**



MAM 4131B

Issued APR 1986
Revised NOV 1996
Cancelled MAR 2003

Superseding MAM 4131A

Aluminum Alloy, Die and Hand Forgings
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T74)
Solution Heat Treated and Aged

UNS A97075

CANCELLATION NOTICE

This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of March, 2003. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications.

AMS 4131 covers the same material.

"CANCELLED" specifications are available from SAE.

SAENORM.COM : Click to view the full PDF of mam4131b

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright 2003 Society of Automotive Engineers, Inc.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: <http://www.sae.org>

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of die forgings and hand forgings procured to metric (SI) units.

1.1.1 AMS 4131 is the inch/pound version of this MAM.

1.2 Application:

These forgings have been used typically for parts requiring a combination of good strength and resistance to stress-corrosion cracking, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

MAM 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings, Metric (SI) Units

AMS 2808 Identification, Forgings

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 594 Ultrasonic inspection of Aluminum-Alloy Wrought Products for Aerospace Applications

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM E 1417 Liquid Penetrant Examination

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6088 Heat Treatment of Aluminum Alloys

MIL-STD-6866 Inspection, Liquid Penetrant

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with MAM 2355.

TABLE 1 - Composition

Element	min	max
Zinc	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.28
Iron	--	0.50
Silicon	--	0.40
Manganese	--	0.30
Titanium	--	0.20
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Solution heat treated and aged in accordance with MIL-H-6088 to the T74 temper.

3.3 Properties:

Forgings shall conform to the following requirements, determined in accordance with MAM 2355:

3.3.1 Tensile Properties: Shall be as follows:

3.3.1.1 Die Forgings:

3.3.1.1.1 With Grain Flow: Specimens, machined from forgings 150 mm and under in nominal thickness at time of heat treatment or from prolongations on such forgings with axis of specimen in area of gage length varying not more than 15 degrees from parallel to forging flow lines, shall have the properties shown in Table 2 provided the as-forged thickness was not more than twice the heat treated thickness.

TABLE 2 - Minimum Tensile Properties

Nominal Thickness at Time of Heat Treatment Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
Up to 75, incl	525	455	6
Over 75 to 100, incl	505	435	6
Over 100 to 125, incl	485	420	6
Over 125 to 150, incl	470	400	6

3.3.1.1.2 Across Grain Flow: Specimens, machined from forgings 150 mm and under in nominal thickness at time of heat treatment or from prolongations on such forgings with axis of specimen in area of gage length varying not more than 15 degrees from perpendicular to forging flow lines, shall have the properties shown in Table 3 provided the as-forged thickness was not more than twice the heat treated thickness. If configuration of the forging or prolongation cannot accommodate the transverse specimen described, acceptance of the forgings shall be based on testing as in 3.3.1.1.3.

TABLE 3 - Minimum Tensile Properties

Nominal Thickness at Time of Heat Treatment Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
Up to 75, incl	490	425	3
Over 75 to 100, incl	485	415	3
Over 100 to 125, incl	470	400	3
Over 125 to 150, incl	450	380	3

- 3.3.1.1.2.1 Elongation requirements shall not apply to specimens having a gage length diameter less than 6.35 mm or located in immediate proximity to an abrupt change in thickness or located so that any part of the specimen gage length is located within 3 mm of the trimmed flash line.
- 3.3.1.1.3 At Angle to Flow Lines: Specimens, machined from forgings 150 mm and under in nominal thickness at time of heat treatment or from prolongations on such forgings with axis of specimen in area of gage length varying more than 15 degrees from parallel and also more than 15 degrees from perpendicular to forging flow lines, shall have the properties shown in Table 3. Such test results shall be identified as neither longitudinal nor transverse tensile results.
- 3.3.1.2 Hand Forgings: Specimens, machined from forgings having an essentially square or rectangular cross section, shall have the properties shown in Table 4 provided that the as-forged thickness does not exceed 150 mm.

TABLE 4 - Minimum Tensile Properties

Nominal Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D %
Up to 50, incl	Longitudinal	505	435	8
	Long-Trans.	490	415	4
Over 50 to 75, incl	Longitudinal	505	435	8
	Long-Trans.	490	415	4
	Short-Trans.	475	415	3
Over 75 to 100, incl	Longitudinal	490	420	8
	Long-Trans.	485	400	4
	Short-Trans.	470	395	3
Over 100 to 125, incl	Longitudinal	470	395	7
	Long-Trans.	460	385	4
	Short-Trans.	455	380	3
Over 125 to 150, incl	Longitudinal	450	370	7
	Long-Trans.	440	360	4
	Short-Trans.	435	360	3

- 3.3.1.3 Special Purpose Forgings: Tensile property requirements for specimens cut from special purpose forgings shall be as specified on the drawing or as agreed upon by purchaser and vendor.

3.3.2 Conductivity: Shall be as follows:

- 3.3.2.1 If the conductivity is 23.3 MS/m or higher and tensile properties meet specified requirements, forgings are acceptable.
- 3.3.2.2 (R) If the conductivity is 22.0 to 23.1 MS/m, inclusive, if tensile properties meet specified requirements, and if the tensile yield strength in the long-transverse direction does not exceed the specified minimum by more than 82 MPa, forgings are acceptable.
- 3.3.2.3 (R) If the conductivity is below 23.2 MS/m and the tensile yield strength in the long-transverse direction exceeds the specified minimum value by more than 82 MPa, the forgings shall be given additional aging heat treatment. If, after such treatment, forgings meet the requirements of 3.3.1 and 3.3.2.1 or 3.3.2.2, the forgings are acceptable.
- 3.3.2.4 If the conductivity is below 22.0 MS/m, the forgings are not acceptable and shall be reprocessed regardless of tensile property level.
- 3.3.3 Stress-Corrosion Resistance: Specimens cut from forgings shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction (perpendicular to grain flow) to 241 MPa for forgings 75 mm and under in nominal thickness and to 50% of the longitudinal (parallel to grain flow) yield strength for forgings over 75 mm in nominal thickness.
- 3.3.4 Grain flow of die forgings, except in areas which contain flash line end grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.

3.4 Quality:

Forgings, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the forgings.

- 3.4.1 All forgings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet the following ultrasonic classes:
- 3.4.1.1 Die Forgings 12.5 to 100 mm, Inclusive, in Nominal Thickness and Weighing Not Over 135 kg: Class B.
- 3.4.1.2 Hand Forgings 25 to 150 mm, Inclusive, in Nominal Thickness and Weighing Not Over 270 kg: Class A.
- 3.4.2 (R) When specified, die forgings shall be etched to produce a surface suitable for visual examination of the forging surfaces for defect indications, such as seams, laps, bursts, and quench cracks. Surface imperfections which can be removed and which do not reappear on re-etching and do not reduce required section thickness are acceptable.

3.4.3 When specified, all forgings shall be subjected to fluorescent penetrant inspection in (R) accordance with ASTM E 1417 or MIL-STD-6866. Acceptance standards shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of forgings shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the forgings conform to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.3.1), conductivity (3.3.2), ultrasonic inspection (3.4.1), and, when specified, surface visual examination (3.4.2) and fluorescent penetrant inspection (3.4.3) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests: Stress-corrosion resistance (3.3.3) and grain flow of die forgings (3.3.4) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with MAM 2355 and the following:

4.3.1 Ultrasonic inspection (3.4.1), and, when specified, surface imperfections (3.4.2) and fluorescent penetrant inspection (3.4.3): All forgings.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the chemical composition, tolerances, and ultrasonic testing and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number, MAM 4131A, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with MAM 2355.